

# Facial Contouring Surgery for Asians

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## ABSTRACT

Asian people, especially women, prefer a more delicate and feminine facial shape. To achieve a softer and better facial contour, there are several procedures to change the facial skeleton. Reduction malarplasty and mandibular angleplasty are common facial contouring operations in Asia. A lot of techniques have been developed independently by several authors. Various approaches can be chosen, such as intraoral or external skin incisions. There are also different contouring methods that can be chosen depending on the patient's morphology and the surgeon's technical preferences. The different osteotomy techniques used to mobilize the zygomatic complex can be classified according to the specific portion that is being repositioned. Resection and contouring methods for a prominent mandibular angle can be subdivided according to the specific type of anomaly. The purpose of this article is to review the concepts and various operative procedures for reduction malarplasty and angleplasty. The authors propose a guideline for selecting the appropriate procedure(s) for individual patients. Decisions should be made according to the patient's need, anatomic variations, and possible operative sequelae.

**KEYWORDS:** Facial contouring surgery, Asians, aesthetic surgery, angleplasty, malarplasty

Shape and size of the facial skeleton are fundamental determinants of facial appearance. Difference in facial skeletal support is one of the most important factors distinguishing people of different ethnic background. When analyzed from the anterior view, a Caucasian face tends to be longer and narrower than that of Southeast Asians. When seen in cross section, it has relatively greater anterior projection and decreased width.<sup>1</sup> Conversely, the Asian face tends to be wider and shorter when observed from an anterior view. When seen in cross section, it has less anterior projection, and the transverse dimension is wider.

In Western cultures, facial skeletal contouring mostly involves augmentation, whereas skeletal reduction is most often performed in Oriental societies. Facial

skeletal augmentation surgery with alloplastic implants is commonly performed in the West where it is generally preferred to have well defined and sharply accented facial contours.<sup>2-4</sup> On the contrary, various operative techniques for facial skeletal reduction surgery have been developed and are frequently performed in Asia where most people perceive square facial bones as masculine and rough.

In Asia, there are many aesthetic procedures available to achieve a softer and better facial contour: malarplasty (zygoma reduction), angleplasty (mandibular angle reduction), genioplasty, orthognathic surgery, rhinoplasty, forehead plasty (fronto-orbital burring), and so forth. A variety of techniques have been independently developed and perfected by several authors. The

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two most popular operations are zygoma reduction and angle reduction. The purpose of this article is therefore to review the concepts behind malarplasty and angleplasty and to describe different operative procedures currently in use. Emphasis is placed on the selection of an appropriate procedure or combined procedures for the individual patient according to chief complaint, anatomic differences, and considerations for possible operative morbidity.

## PREOPERATIVE EVALUATION AND TREATMENT PLANNING

Before the operation, the surgeon should carefully interview the patient and perform a physical examination that includes inspection and palpation of facial bones. The surgeon must assess the contribution of both soft tissues and bony framework to the patient's facial deformity. An inadequate assessment may lead to the selection of a procedure that does not address the desired change.

Anthropometric and radiologic evaluations are important steps in the surgical planning. For example, Hinderer's analysis gives the surgeon a reference frame to compare the ideal malar eminent point with the current point and to measure the difference.<sup>5</sup> In this analysis, the most prominent point of the malar bone should be at or slightly superolateral to the intersection

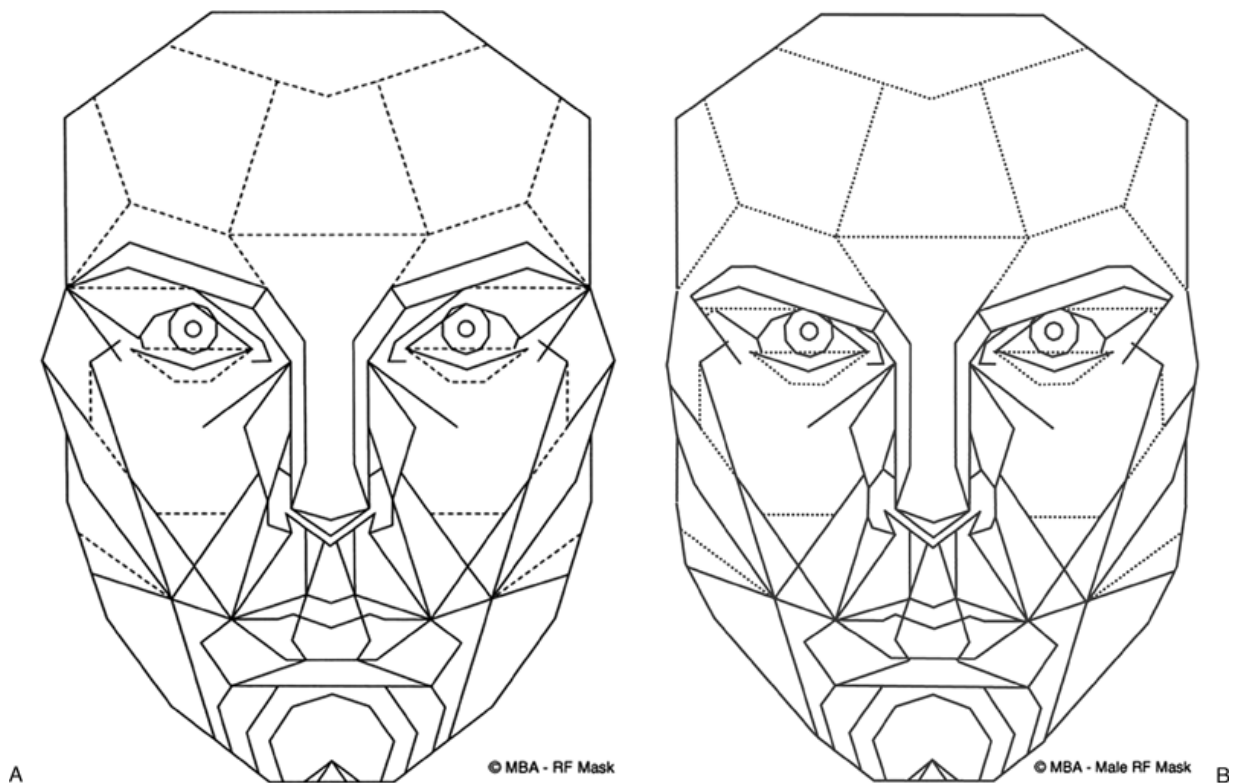
of two lines: (1) a first line extending from the external canthus to the lateral commissure; (2) a second line extending from the superior aspect of the tragus to the nasal alar base.

Facial analysis with the "golden facial mask" makes it easy to recognize facial imbalances and malposition of facial structures (Fig. 1).<sup>6,7</sup> It also provides a useful patient interview tool. In addition, a three-dimensional computed tomography (CT) scan gives detailed information on the underlying skeleton and helps to determine where the osteotomies should be made. The three-dimensional skull model made from the CT data can be used for surgical planning as well as for simulation surgery. These studies can be used to measure the amount of bone needing resection. With these visual studies, it is then easier to explain to the patient the goals and expectations from the surgery, its limitations, and possible complications. As a final step, the surgeon must be certain that the patient truly wants the change that will occur after the planned contouring surgery.

## REDUCTION MALARPLASTY

### Exposure and Techniques

The malar complex can be exposed and manipulated through intraoral, coronal, or preauricular incisions.



**Figure 1** Golden facial mask: (A) female mask; (B) male mask. (From Kim YH. Easy facial analysis using the facial golden mask. *J Craniofac Surg* 2007;18:643–649. Reprinted with permission.)

Onizuka et al described an intraoral approach to shave the malar complex. However, it is difficult to reduce the zygomatic arch with this method.<sup>8</sup> Whitaker advocated a coronal approach for burring down both the zygomatic arch width and the malar prominence.<sup>9</sup> Contouring the malar complex using burring alone (and no osteotomies) has several limitations, including difficulty in maintaining symmetry, loss of normal cheekbone curvature, and a limited reduction. Furthermore, burring of prominent zygomas without reducing the bizygomatic distance (which is a limitation of some burring techniques) produces malar flattening and a resulting impression of facial widening, which are aesthetically undesirable in most patients requiring malarplasty.

### Malar Complex Shaving Techniques and Arch Reduction

Uhm and Lew described a technique combining zygomatic body shaving and arch reduction.<sup>10</sup> Zygomatic shaving is made through an intraoral approach. Zygomatic arch reduction is achieved either with a greenstick fracture through a pretragal incision or with osteotomies of the arch through a bicoronal incision. Yang and Park also reported on intraoral shaving of the zygomatic body.<sup>11</sup> They advocated multiple infractures of the zygomatic arch through a temporo-preauricular incision. Hwang et al modified Yang and Park's method for better control of the arch reduction.<sup>12</sup> After burring the zygoma through an intraoral approach, a vertical corticotomy of the lateral zygomatic body is performed through the same incision. A complete osteotomy of the proximal arch is made through a small preauricular incision and the arch is then infractured, in a greenstick-like manner. This technique requires experience to achieve symmetric arches after infracture.

### Malar Osteotomies

Osteotomies for malar complex repositioning can be performed via a coronal incision or through combined intraoral and preauricular incisions. Baek et al described techniques for malar reduction involving a coronal approach. They simply reposition the osteotomized zygoma or remove completely the malar complex, contour it, and reinsert it in proper position as a free graft.<sup>1</sup> This free graft technique has been abandoned. It has been replaced by sliding the osteotomized zygoma superoposteriorly.<sup>4,13</sup>

For mildly prominent malar complexes, the lateral orbital osteotomy line can be executed in a vertical direction, whereas it can be more oblique for severely prominent zygomas. This has no effect on the survival of the malar bone after the procedure, because the osteotomized zygoma retains soft tissue attachments and hence its blood supply.

Malar reduction with osteotomies and repositioning through a bicoronal incision has advantages.<sup>1</sup> A wide operative field allows for precise osteotomies and repositioning. In a middle-aged female patient, a forehead lift can be performed without additional incisions. The drawbacks are that it takes more time, leaves a long scalp scar, and facial nerve injury is a possibility.

Sumiya et al advocated another malar reduction technique based on an osteotomy of the zygoma through an intraoral incision plus an osteotomy of the zygomatic arch through a small preauricular incision.<sup>14</sup> The zygomatic complex is moved into proper position. The zygomatic body is fixed with a miniplate, and the arch is fixed with a wire.

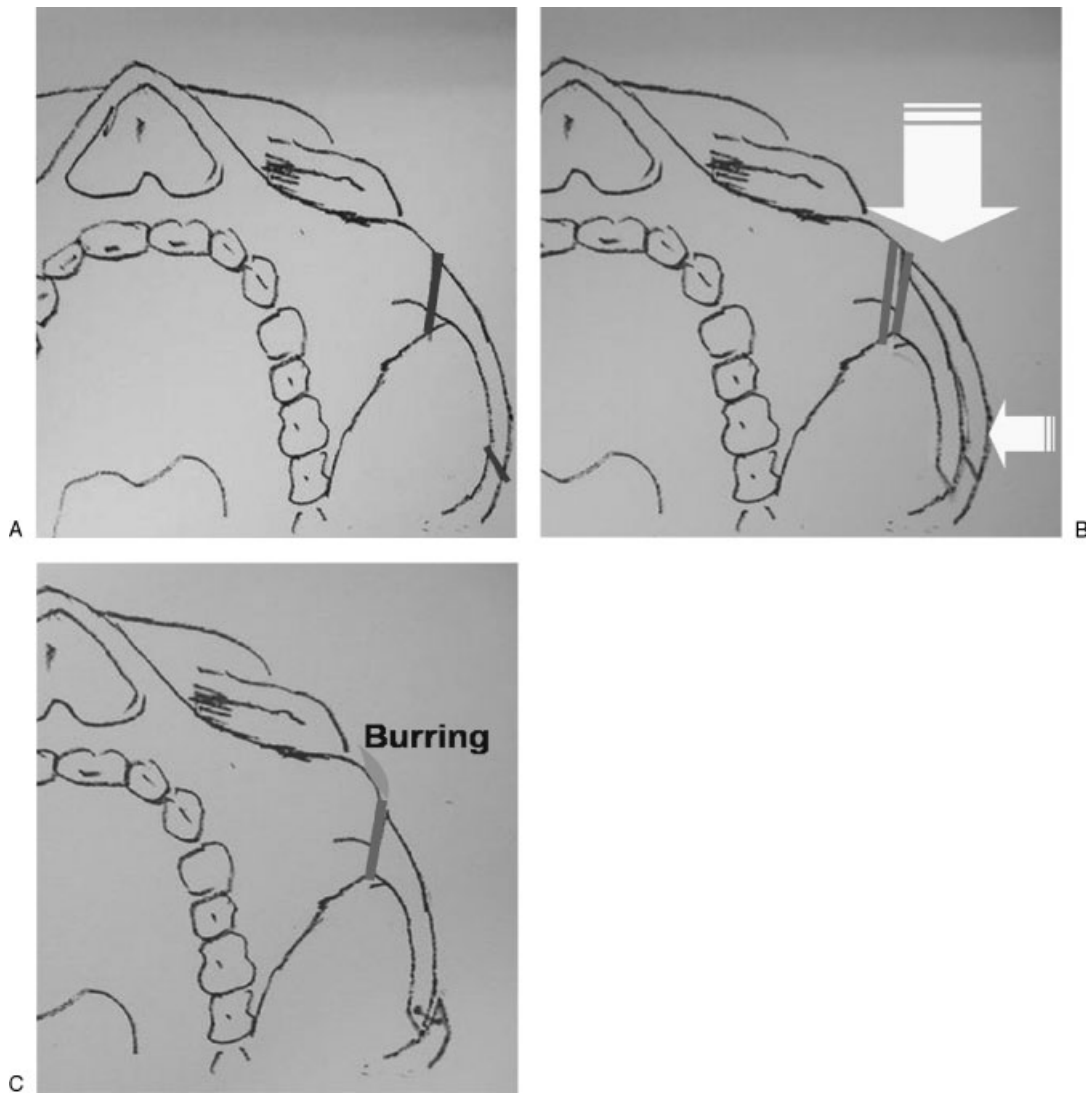
With the intraoral approach alone, exact osteotomies can be performed after exposure of the zygoma, from the zygomaticomaxillary suture to the lateral orbital rim, and after zygomatic arch degloving. Cheek droop is consequently a major complication from solitary intraoral approach. Adequate exposure for osteotomies can often be gained only after extensive soft tissue detachment. The masseter's origin should be preserved to ensure minimal cheek drooping after reduction. The main advantage of this technique is that it spares the preauricular scar. It is also less invasive than the bicoronal approach and has a shorter operative time. However, achieving symmetric cheeks can be more difficult.

Kim and Seul described a modified technique of reduction malarplasty through an intraoral incision.<sup>15</sup> An L-shaped osteotomy is performed on the zygoma to create a lateral segment made of the lateral zygomatic body and the arch. Two parallel vertical or oblique osteotomies allow removal of excessive bone. Through the same approach, a curved osteotome is used to break the posterior zygomatic arch. The zygomatic arch can now be moved medially. This technique is an effective and safe method of reducing the body area of the malar complex.

### Choosing the Right Osteotomies

Performing osteotomies of the zygomatic complex is generally more reliable and effective than are shaving techniques. Osteotomy techniques can be subdivided according to the portion of zygomatic complex that is repositioned: body, arch, or both. This subdivision depends on the patient's morphology and the surgeon's technical preferences (Fig. 2).

When both the zygomatic body and arch are prominent, the complex is mobilized as a unit and repositioned in a proper location. There are two osteotomy sites: the zygomatic body and arch. The zygomatic body osteotomy is performed inferolaterally to the orbit, at the zygomaticomaxillary buttress, leaving the orbital rim intact. After two parallel vertical osteotomies are performed on the zygomatic body, the midsegment is removed to allow for latter medial displacement of the



**Figure 2** A method of mobilizing the zygomatic complex could be subdivided according to a specific repositioning portion of zygoma: body, arch, or both. (A) Two osteotomy sites: the zygomatic body and arch. (B) When zygoma body prominence is dominant, the zygomatic complex is moved backward more (large arrow) and when arch is more prominent, the complex is moved medially (small arrow). (C) View after reposition and fixation of zygomatic complex.

zygoma. Next, the zygomatic arch is cut posteriorly, allowing free movement of the malar complex. The zygomatic arch is depressed medially. The stable, non-osteotomized part of the arch often overlaps the mobile arch to allow for zygomatic body retrusion (Fig. 3). In patients presenting asymmetric prominent zygomas, differential resection of bone can usually restore symmetry.

When lateral protrusion of the arch is prominent and body protrusion is mild, incomplete osteotomy of the zygomatic body area and complete cut of the arch is indicated. The protruding part of the zygomatic body is shaved, and a lateral corticotomy (not a complete osteotomy) is performed using a reciprocating saw. The zygomatic arch is then osteotomized. The arch is depressed medially, hinging at the zygomatic corticotomy. The arch is positioned deep to the posterior non-osteotomized segment of the arch.

When there is predominant lateral protrusion of the zygomatic body, but the arch is straight and has a normal shape, complete osteotomy of the body and greenstick fracture of the arch are performed. The zygomatic body osteotomy is done with a reciprocating saw. Osteotomy and reduction of the zygomatic body are done through an intraoral approach (Fig. 4). Incomplete osteotomy on the arch can be done through various approaches including a preauricular incision, a temporal stab incision, or an intraoral route.

When the intraoral route is chosen, a sharp, curved osteotome is slid against the medial aspect of the arch until the desired osteotomy location on the posterior arch is reached. An incomplete arch osteotomy is performed from deep to superficial with the osteotome. The point of fracture is at the anterior part of the zygomatic tubercle (skeletal landmark) or the anterior





**Figure 3** (A, B) Preoperative view of a 21-year-old woman with malar protrusion. (C, D) Postoperative views 2 years after reduction malarplasty on each side.

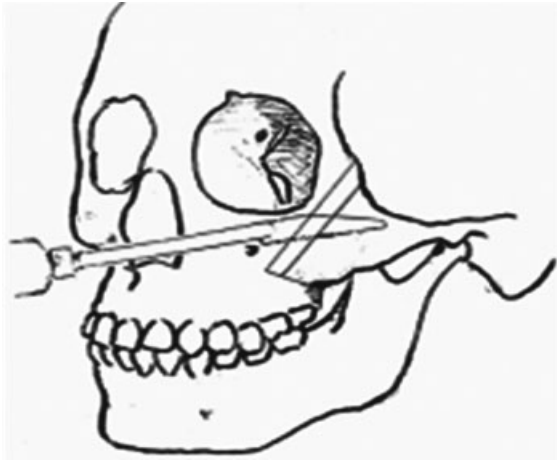
sideburns line (surface landmark). When the malar complex is freely movable, the body portion is transposed medially and fixed.

There are also other ways to achieve zygoma reduction. Multiple incomplete osteotomies can be performed on the zygomatic body and arch using either a saw or an osteotome. Digital pressure is then used to reposition the bone under direct vision. This can be done either through an intraoral or a temporo-preauricular incision.<sup>11</sup> An innovative method for contouring the zygomatic complex was reported by Lee et al.<sup>16</sup> Zygoma reduction is achieved blindly through a small 5-mm intraoral stab incision. After multiple complete and incomplete osteotomies of the zygomatic body and arch (usually on its medial aspect), pressure from both hands is used to compress the complexes in place. This technique requires the use of a special saw and rasp that have openings for irrigation and suction.

### REDUCTION ANGLEPLASTY

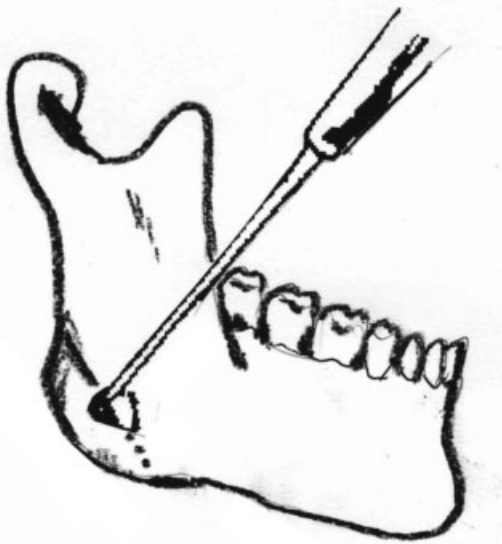
The “square-face” appearance brought by exaggeratedly prominent mandibular angles usually gives a severe and masculine appearance. A more delicate and feminine facial shape can be obtained by resecting prominent mandibular angles. Various methods of angleplasty have been reported in Asia where this aesthetic procedure is frequently requested. Most reduction angleplasty techniques are performed through an intraoral approach. Surgical techniques differ in the resection technique and anatomic structure being resected.

Historically, masseter muscle hypertrophy was incorrectly regarded as the main cause for prominent mandibular angles. The advocated treatment was partial masseter resection only. With advances in craniofacial surgery and aesthetic surgery, it is now recognized that the square-face appearance is due to a posterior projection and/or lateral flaring of the osseous man-



**Figure 4** L-shaped osteotomy at the zygomatic body. (From Kim YH, Seul JH. Reduction malarplasty through an intraoral incision: a new method. *Plast Reconstr Surg* 2000;106:1514. Reprinted with permission.)

dibular angle. Baek et al first reported the resection of prominent mandibular angle using an oscillating saw through intraoral incisions (Fig. 5).<sup>17</sup> Later, they refined their contouring method to obtain better facial appearance in both lateral and frontal views.<sup>18</sup> They classified patients according to the anatomic type of mandibular angle: lateral bulging, posteroinferior projection, or both. For the “lateral bulging” type, a parasagittal osteotomy of the angle is done with the reciprocating saw. For the “posteroinferior” type, a curved posterior osteotomy is performed with a 90-degree oscillating saw (Fig. 5). In some cases, the two methods are applied simultaneously.



**Figure 5** Resection of the prominent mandible angle using an oscillating saw through intraoral incision.

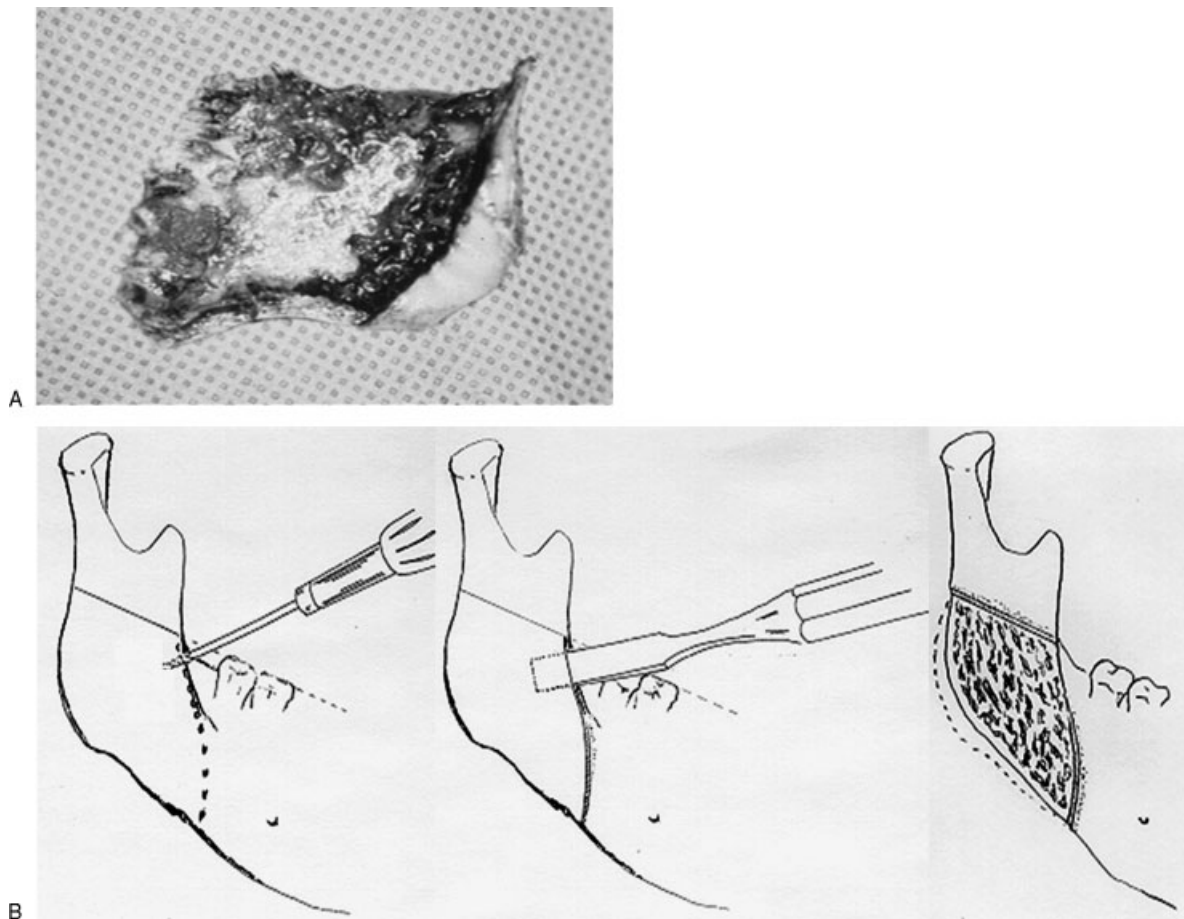
Yang and Park reported angle resection with serial osteotomies, proceeding from the posterior ramus to the anterior body.<sup>19</sup> After removal of the first, most posterior segment, it became easier to cut the more anterior second segment. A third segment, more anteriorly, was at its turn more easily resected. They reported that this multistaged osteotomy technique could prevent unfavorable results, such as asymmetry, undercorrection, overcorrection, and an incorrect contour line as can sometimes be found with straight cutting of the mandibular angle.

To achieve a natural-looking mandibular angle, the lateral cortex of the mandibular angle can be removed with parasagittal mandibular angle cortectomies.<sup>20–22</sup> The lateral mandibular body, angle, and ascending ramus are exposed. Horizontal and vertical osteotomies are done with the reciprocating saw. An osteotome is used to remove the lateral cortex and some portion of the ascending ramus *en bloc* (Fig. 6A). Additional bone can be removed if symmetry is not adequate. Additional resection is sometimes limited by the trajectory of the inferior alveolar nerve, which can become exposed by burring deeper. This procedure provides a good result in both lateral and frontal views (Fig. 7). It also avoids injury to the facial nerve and vessels as well as subcondylar fracture. Injury to the inferior alveolar nerve with resultant lower-lip numbness is possible if one is not careful during the osteotomy.

All the described operative methods can be performed through an intraoral approach. In some cases, an additional external skin incision can make it easier to operate. Those who have a narrow intergonial distance, or posteromedially tilted angles, give limited intraoperative visual assessment and offer difficult instrument placement during an intraoral approach. Submandibular skin incision gives a good access to the angle area and allows the surgeon to proceed easily. However, the external scar is a concern.

Angle reduction also can be performed by a combination of internal and external methods.<sup>23</sup> Mandibular angle is exposed through a 3-cm intraoral incision. After subperiosteal dissection, a 3-mm stab incision is made below the chin line. The reciprocating saw is inserted intraorally and the saw handle brought outside through the stab skin wound. The angle osteotomy can then be performed intraorally under direct vision.

Lee et al reported a minimally invasive method using a special rasp and saw with openings for irrigation and suction.<sup>24</sup> After a 4- to 6-mm stab incision is made below the chin line, the inferior mandibular border is dissected from the chin to the tip of the gonion with an elevator. Rasping and cutting starts at the gonion and extends laterally on the mandibular body, and anteriorly up to the chin. The technique is mostly blind and there appears to be a long learning curve.



**Figure 6** Mandibular angle reduction using angle splitting osteotomy. (A) Resected segment of the lateral cortex and some portion of the ascending ramus en bloc. (B) Horizontal and vertical osteotomies using burr saw and osteotome.

## COMPLICATIONS

### Malarplasty Complications

Improperly performed malarplasty can have many complications, most of which cause asymmetry. Cheek asymmetry can result from inaccurate preoperative planning. Inadequate fixation of the anterior aspect of osteotomized zygoma can result in displacement. Special care should be given to perform a clean and straight cut at the upper portion of the malar complex. This will allow good bony contact, easier rigid fixation, and better healing.

Cheek drooping is a possible complication when malarplasty is performed intraorally. It is important during intraoral dissection to preserve the masseter muscle attachments on the zygomatic arch.

### Angleplasty Complications

Complications from mandibular angle reduction include bleeding, hematoma, infection, asymmetry, undercorrection, overcorrection, condyle fracture, and facial nerve palsy. Excision of masseter muscle may cause bleeding, intense and prolonged swelling, trismus, and a risk of

facial nerve palsy. Intraoperative bleeding can often be controlled by vessel ligation and compression. The use of drain tubes is useful for hematoma prevention.

Asymmetric or undercorrected mandibular angles may need reoperation. Overcorrection is manifested by blunting of the mandibular angle. Fat grafting and mandibular angle augmentation with autogenous bone or alloplastic implants can be done (Fig. 8).

A condylar fracture is a serious complication. It can result from blind angle osteotomy or from using an osteotome instead of a saw to complete an osteotomy. An uncontrolled fracture can then extend to the condylar neck. Linear condylar fractures are treated with intermaxillary fixation for 4 weeks. A displaced condylar fracture might require additional open reduction before intermaxillary fixation. Facial nerve palsy can result from traction or direct trauma to the facial nerve, especially by accidental penetration of an instrument behind the ascending ramus. Treatment for facial nerve palsy could be conservative, waiting for spontaneous recovery.

To avoid complications of malar reduction or mandibular angle reduction, preoperative planning for exact bone resection is mandatory. In addition, the operative technique is chosen depending on the facial



**Figure 7** (A, B) Preoperative view of a 26-year-old woman who complained of "square face." (C, D) Postoperative views 5 years after mandibular angle splitting osteotomy. Reduction malarplasty and genioplasty were performed as concomitant procedures.

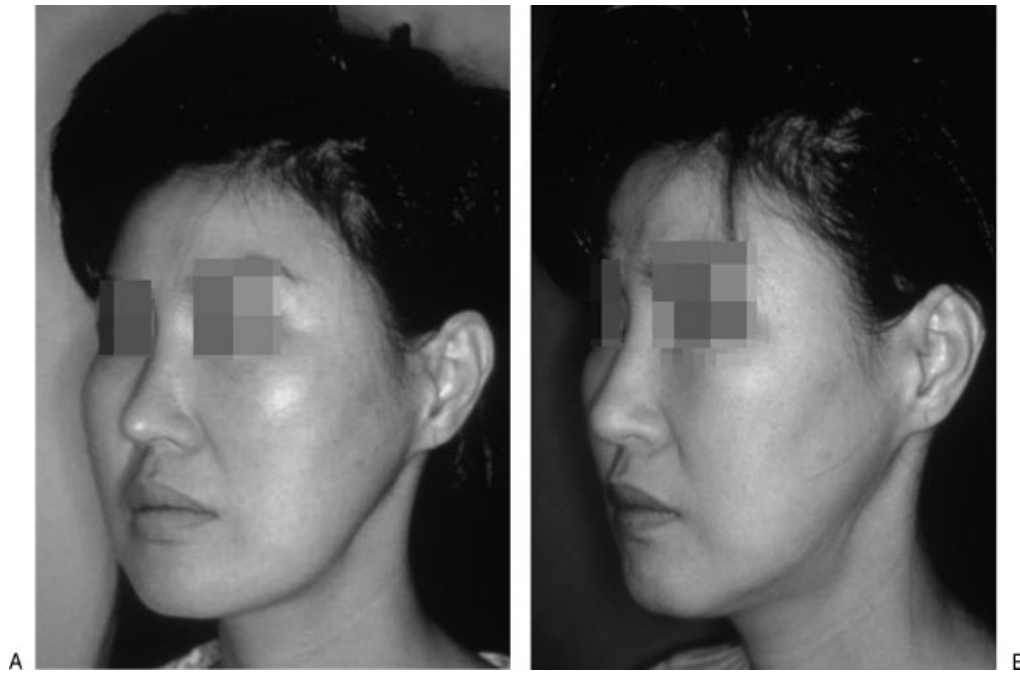
contour and shape and patient's age. Blind osteotomy or osteotomy should be avoided, and direct visualization with adequate protection of the soft tissue is recommended.

## DISCUSSION

Patient selection for facial contouring surgery is extremely important because the procedures can drastically and permanently change one's appearance. To achieve

the best results, the surgeon should be familiar with all techniques, with their respective postoperative course, and be conscious of his or her own ability to analyze and correct a patient's face. The surgeon must be certain that the patient truly wants the change that will occur after the surgery. Various contouring procedures are available. It is sometimes advantageous to combine different procedures to re-equilibrate all parts of the face. These procedures should be selected according to the patient's complaint, age, sex, and morphology.





**Figure 8** (A) A 40-year-old woman complained of too steep mandibular angle and depression on angle area after reduction angleplasty. (B) One year after recontouring mandibular body and angle area and fat grafting on depressed area.

The face can be divided into highlight and lowlight areas.<sup>25</sup> The highlight areas are the supraorbital ridge, the malar-midface structure, and the mandible-chin. The lowlight areas are the forehead, the orbital-temporal region, and the soft tissues of the cheek and neck. Alteration of the highlight areas is generally achieved by bony changes, and alteration of the lowlight areas is by soft tissue changes. Facial bone contouring surgery is performed with an intention to change the highlight area. In Asians, alteration of the highlight area with central accentuation such as nasal augmentation and lateral contour reduction surgery gives great help to produce an attractive face.

The most commonly performed aesthetic procedures on the face include malarplasty, angleplasty, genioplasty, dentoalveolar surgery (orthognathic surgery), rhinoplasty, forehead plasty, blepharoplasty, and liposculpture. Among these, reduction malarplasty and reduction angleplasty combined with these surgeries are a valuable way to restore an attractive appearance.

The whole face should be regarded as one unit. Therefore, with a round or oval-shaped face in frontal view, reduction malarplasty is effective for reshaping the facial features. With a square-shaped face, reduction malarplasty alone causes an imbalance in the facial shape as the remaining mandibular angles appear more prominent after the procedure. In such cases, reduction of the mandibular angle should be done simultaneously to create an oval-shaped face. Genioplasty is helpful for correction of a short and/or recessed chin. For those who have flat faces in lateral and superior views, central

accentuation surgeries such as augmentation rhinoplasty and genioplasty are helpful to restore an attractive profile.

## CONCLUSION

Facial bone contouring surgery is an effective procedure for patients with wide or prominent zygoma and mandibular angle. Preoperative evaluation and planning should be careful so that both surgeon and patient have mutual understanding and agreement. Surgery should be performed with care. Clear exposure of the osteotomies is advised to avoid complications. Ancillary procedures can be combined to obtain better results when they are judged necessary.

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